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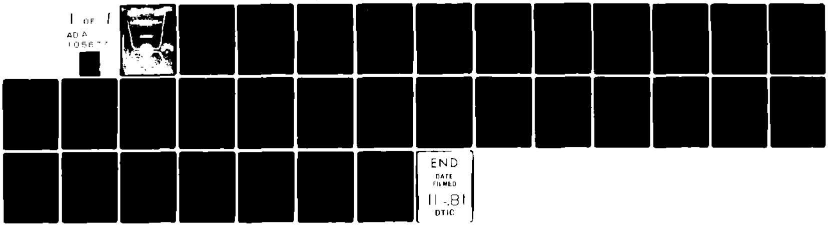

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TAILORING SHIPBOARD TRAINING TO FLEET PERFORMANCE NEEDS: II. PROPULSION ENGINEERING PROBLEM ANALYSIS

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A needs assessment strategy was designed to identify and assess differences between actual and desired performance of main propulsion personnel and deficiencies in the various support and administrative systems. Shipboard managers and operator personnel were interviewed aboard the "pilot" ship during a 14-day transit from Japan to the United States during November 1977. Both managers and operators reported the primary performance problem to be watchstanding; specifically, the difficulty of attaining and maintaining three fully qualified propulsion watch sections at all watch stations.

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Substantial deficiencies were also reported in the support and administration systems. The needs assessment strategy provided sufficient information about main propulsion performance deficiencies to initiate development of training solutions.

FOREWORD

This research was conducted within the Advanced Development Subproject Z1180-PN.01, Enhancing Fleet Readiness Through Improved Shipboard Training, under the sponsorship of the Chief of Naval Operations (OP-01). The objectives of the subproject are to design, develop, and evaluate an approach for identifying shipboard personnel readiness deficiencies and to develop training programs compatible with shipboard environments.

This report is the second in a series under this subproject. The first, NPRDC Tech. Rep. 78-30, detailed the overall approach and the initial steps of the problem definition. The principal result was identification of main propulsion as the shipboard performance area of greatest concern to fleet representatives. The needs assessment effort presented in this report was conducted during FY77 and comprised the final step in the problem definition stage. Subsequent reports will deal with solution strategies, implementation, and evaluation. The information from this needs assessment will serve as a basis for specifying the performance criteria of a shipboard training program to be developed in accordance with the goals of the subproject Z1180-PN.01.

Appreciation is expressed to Commander, Naval Air Forces, U.S. Pacific Fleet and Commander, Naval Air Forces, U.S. Atlantic Fleet for their assistance in providing necessary access.

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Technical Director

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SUMMARY

Problem and Background

This research was conducted as part of an effort to design, develop, and evaluate an approach for identifying shipboard personnel readiness deficiencies and to develop responsive shipboard training. A previous effort identified main propulsion as the shipboard performance area of greatest concern to the fleet. However, there was little agreement on the specific characteristics and causes of the problems in main propulsion.

Objectives

The objectives of this effort were to design and conduct a shipboard needs assessment of main propulsion plant operator performance to be used as basis for the design of shipboard training programs.

Method

A needs assessment strategy was designed to identify and assess the differences between actual and desired performance of main propulsion personnel and to identify and assess deficiencies in the various support and administrative systems. Structured interviews developed for shipboard managers and operators were administered aboard the "pilot" aircraft carrier during a 14-day transit from Japan to the U.S. during November 1977. To verify the needs assessment data, an abbreviated assessment was conducted aboard an East Coast aircraft carrier, and the questionnaires were administered to representatives from other key organizations. All responses were categorized for analysis.

Results

The mission of an aircraft carrier's main propulsion plant is to provide motive power, electrical energy, catapult steam, and steam for various support functions on a 24-hour basis. Providing this capability on a sustained basis requires from 250 to 300 trained personnel. Of these, approximately 50 percent are firemen directly from recruit commands.

Both managers and operators reported watchstanding as their primary performance problem; specifically, the difficulty of attaining and maintaining three fully qualified main propulsion watch sections at all watch stations. Substantial deficiencies were reported in the support and administrative systems. The data obtained from the assessment aboard the East Coast aircraft carrier and interviews with major commands confirmed that performance problems and support system deficiencies reported on the "pilot" ship were generally common to all ships with 600/1200 psi main propulsion plants.

Conclusions

1. The needs assessment provided sufficient information about main propulsion performance deficiencies to initiate development of appropriate training solutions.

2. The needs assessment is feasible for use in other shipboard areas where mission performance capabilities do not appear to meet specified performance standards.

Future Direction

The information derived from the needs assessment is being used to design and develop a shipboard main propulsion training program to alleviate the identified performance discrepancies and associated support system deficiencies.

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INTRODUCTION

Problem

Main propulsion plant operator performance is a shipboard performance area of critical concern to the fleet and an area where training assistance is desired. However, there is little agreement on the specific characteristics and causes of the problem. Suggested causes include high personnel turnover rates, inadequate formal training ashore, deficient maintenance skills, and inadequately-documented operating procedures. As a result, an effort was required to determine the specific problems and to identify those deficiencies amenable to training solutions.

Objectives

The objectives of this effort were to design and conduct a shipboard needs assessment of main propulsion plant operator performance to be used as a basis for the design of shipboard training programs. This "pilot" application was also intended to determine the feasibility of this approach for other shipboard performance problem areas.

Background

This work is part of a larger effort to design, develop, and evaluate an approach for identifying shipboard personnel readiness deficiencies and to develop responsive training programs compatible with shipboard environments. The overall effort is based on the premise that conventional instructional methods and materials designed for schoolhouse settings may be inapproapriate for shipboard environments where facilities are limited and training must compete for support with operational requirements.

At the start of this project, a general approach was designed to tailor training programs to the requirements of shipboard environments. This approach emphasized: (1) identification of critical existing performance deficiencies, (2) analysis of the identified problem areas to determine training requirements and operational constraints, (3) development of specific training solutions for the requirements and constraints identified in the problem analysis, and (4) validation of proposed training solutions in terms of job performance. Within this framework, a survey of shipboard performance problems was conducted and main propulsion was selected as the target area for study (Main, Abrams, Chiles, Flaningam, & Vorce, 1978).

A review of various approaches to assessing training needs (Dick & Carey, 1977; Kaufman, 1972; Sweigert, 1971; Witkin, 1977) indicated that system characteristics, performance discrepancies, and system component deficiencies are required to characterize a performance problem completely.

1. System characteristics for main propulsion include: (a) the functions and mission of the propulsion system, (b) the equipment constituting the system, (c) the number and kinds of personnel required to man the system, and (d) the support and administrative systems, such as the Engineering Operational Sequencing System (EOSS) and the Personnel Qualifications Standards (PQS).

2. Performance discrepancies are those deficiencies revealed by comparing desired performance with actual performance in terms of stated system functions and mission.

3. System component deficiencies are those factors in the system that, when inappropriately designed or used, result in performance decrements.

METHOD

The approach for conducting the shipboard needs assessment of the main propulsion plant operator performance included: (1) obtaining information about system characteristics, (2) gathering performance discrepancy and system component deficiency data, (3) analyzing the response data, and (4) verifying the needs assessment data.

System Characteristics Information

Information about system characteristics (i.e., the functions and mission of the propulsion system, the equipments constituting the system, the number and kinds of personnel required to man the system, and the support and administrative systems involved) was acquired by the research team in various ways. Indoctrination for the basic propulsion system was provided by Seacor, Inc., a contractor with extensive propulsion system experience. Following the indoctrination, research team members attended the propulsion engineering portions of the Surface Warfare Officers Course at the Naval Amphibious Base, Coronado, California. Team members acquired additional familiarity by visiting the Propulsion Engineering School, Great Lakes; Propulsion Engineering courses at Fleet Training Center, San Diego; and ships.

Interviews were conducted with technical experts such as the Chairman of the Conventional Marine Propulsion Training Steering Committee, members of the Propulsion Examining Board (PEB), and personnel from type commands. Formal school instructional materials, Navy directives, operating procedures, and technical manuals were also reviewed for information about system characteristics. These sources provided mission definition information, propulsion system functional diagrams, equipment depictions, layout diagrams, narrative descriptions of system functions, manning requirements, and specification of the support and administrative systems related to main propulsion.

Performance and System Component Data

Performance and system component data were needed to identify and assess the nature and extent of the performance discrepancies and deficiencies in the system components that are intended to support performance. Although a number of data collection methods, including the Delphi technique (a technique for eliciting judgments from subject matter experts), mail-out questionnaires, existing reports, and structured interviews of main propulsion personnel aboard a ship, were considered, the first three listed were rejected. Use of the Delphi technique was precluded because of time constraints. Mail-out questionnaires were not used because they typically encounter fleet resistance and yield poor response rates. Relevent reports were available from the PEB, but these infrequently conducted examinations of individual ships provide only limited operator performance data. Thus, structured interviews for managers and operators were designed to address all operating and support functions indentified as contributing to main propulsion operator performance. Both questionnaires are presented in Appendix A.

Fleet representatives indicated that the most opportune time to interview main propulsion personnel without interfering with their duties would be during their watch periods at sea. Thus, Commander, Naval Air Forces, Pacific Fleet arranged for the structured interviews aboard the "pilot" aircraft carrier during a 14-day transit from Japan to the U.S. during November 1977.

Manager Questionnaire

The manager questionnaire, which was administered to officer and management level engineering personnel, addressed the following main propulsion areas: (1) watchstanding, (2) the PQS training management system, (3) the preventive maintenance system (PMS), (4) corrective maintenance, and (5) other. Once general problem areas were identified, the balance of the effort focused on obtaining more detailed definition of the problems. Subsequent interviews were, therefore, limited to those personnel identified as experiencing the problems or contributing to them.

Interviews were conducted with the highest management levels first. The commanding officer was interviewed concerning overall plant performance problems. Next, the chief engineer, the main propulsion assistant (MPA), and engineering department division officers were interviewed to obtain their perceptions of the major performance problems and to identify those lower level organizational elements considered to be specific problem areas. A total of 15 managers was interviewed.

Operator Questionnaire

The operator questionnaire was designed to provide information on the problems of watch station personnel, who perform operator tasks when standing watch and maintenance tasks when not on watch. Since the four separate main propulsion spaces on an aircraft carrier are manned on a 24-hour basis, it was not possible to interview all personnel. Instead, each interviewer interviewed the equivalent of all members of one watch section--approximately 14 watchstanders, each with different responsibilities--in each of two assigned main propulsion machinery spaces. In addition, to the extent possible, all watch supervisors and a sampling of the remaining watch section members were interviewed for a total of 82 watchstanders and 14 watch supervisors.

In order to verify and augment the information obtained from the initial interviews, the interviewers summarized their notes daily. Subsequently, these summary problem statements were presented to previously interviewed personnel for their reactions and additional comments. An overall summary was presented to the MPA, chief engineer, and commanding officer for their final review and comment.

Response Analysis

All interview responses were categorized into these problem areas: (1) watchstanding, (2) preventive maintenance, (3) corrective maintenance, and (4) other. The responses of watchstanders and watch supervisors to the operator questionnaire were further categorized into more specific problems within each of these four problem areas. Finally, responses were classified as either (1) system component deficiencies, if they were related to systems intended to facilitate operator performance, or (2) performance discrepancies, if they related directly to poor operator performance.

Data Verification

To determine if the needs assessment data were broadly representative, a similar, but abbreviated, effort was conducted aboard an aircraft carrier on the East Coast. During a 3-day period at sea, 55 personnel ranging from the commanding officer to supervisory level watchstanders were interviewed. The questionnaires were also administered to representatives from these key commands and organizations: Commander, Naval Air Forces, Atlantic Fleet; Commander, Naval Surface Forces, Atlantic Fleet; PEB; and the Conventional Marine Propulsion Training Steering Committee. Response analysis for these administrations was similar to that for the pilot ship.

RESULTS AND DISCUSSION

System Characteristics

The mission of an aircraft carrier's propulsion plant is to provide motive power, electrical energy, catapult steam, and steam for various support functions on a 24-hour basis. To provide this capability for sustained periods requires three qualified watch sections.

The pilot ship's 1200 psi main propulsion equipment is housed primarily in four main machinery rooms and two auxiliary machinery rooms. Each main machinery room contains two propulsion boilers, a main engine, pumps, forced draft blowers, a generator, a deaerating feed tank, plus a variety of auxiliary machinery and interconnecting piping. Each auxiliary machinery room contains generators, evaporators, and a variety of auxiliary machinery and piping that support propulsion plant and ship operation.

The operation of a 1200 psi propulsion plant involves from 250 to 300 personnel ranging from the commanding officer and chief engineer down to entry level engineering watchstanders. Approximately 50 percent of these personnel are firemen directly from recruit commands, who must fill billets that require a higher level of training or experience. On the average, ships experience a complete turnover of engineering personnel every 15 months and manning levels of higher rated petty officers in main propulsion are significantly below the levels called for in ships' manning documents.

The primary main-propulsion shipboard support and administrative systems identified are listed below:

1. EOSS, the management support system that specifies the propulsion plant operating and casualty control procedures.

2. PQS, an administrative system that specifies skill, knowledge, and performance requirements for qualified operators.

3. Shipboard on-the-job training (OJT), which is conducted in the operational setting (the deck plates), with qualified watchstanders serving as tutors to provide apprentices with the skills and knowledge required to perform their tasks.

4. Technical documents providing system and equipment information, which are available aboard ship to support personnel performance both during operations and training. These documents include the Plant Operating Guide (POG), the Propulsion Plant Manual (PPM), and technical manuals.

In addition to these shipboard support systems, four external organizations play important roles in supporting main propulsion performance:

1. The Naval Sea Systems Command (PMS-301), which manages the Navy's 1200 psi Propulsion Plan Implementation Program and is responsible for developing programs and materials (e.g., EOSS) to support improved propulsion plant performance.

2. The PEB, which has final responsibility for certifying that the steam propulsion plant equipment is safe to steam and that the watch teams are qualified. This function establishes the PEB as a key agency in assessing the results of any performance improvement program.

3. The Conventional Marine Propulsion Training Steering Committee (CMPTSC), which is chartered by the Chief of Naval Operations (CNO) to develop and oversee the implementation of changes to conventional marine propulsion training. Principal members include representatives of CNO (OP-01, OP-03, OP-05), PMS-301, the Chief of Naval Education and Training, the Chief of Naval Technical Training, and PEB. This committee is in a key position to facilitate and support the implementation of the training problems solutions.

4. The Engineering Mobile Training Team (EMTT), units functioning under type commanders that provide limited engineering subject matter experts to the ships for training and inspection.

Performance Discrepancies

The manager and operator interview responses indicated that watchstanding is the primary performance problem area. More than 50 percent of the managers' problem statements cited watchstanding, and the difficulty of attaining and maintaining three fully qualified main propulsion watch sections was also frequently cited. Because of a shortage of fully qualified personnel, marginally qualified personnel are used regardless of their proficiency. These minimally qualified operators often make errors in casualty situations that create additional casualty effects.

More than 70 percent of the watchstanders and watch supervisors indicated that they were dissatisfied with their ability to operate the main propulsion plant. Their principal concern was a lack of understanding of how the plant functions as a system. This results in their lack of confidence to perform such infrequent, but critical, tasks as plant startup.

Both managers and operators reported performance deficiencies in the area of maintenance. Managers stated that there were not enough experienced people to perform the task required by PMS and that using inexperienced personnel often aggravated equipment problems. The operators cited a lack of necessary materials and tools as well as their own lack of understanding of maintenance requirement cards (MRCs). No consistent patterns were found in comments related to safety or other problem areas.

System Component Deficiencies

A majority of the watchstanders (62%) and watch supervisors (77%) reported that the PQS system does not adequately assess the degree to which a watchstander is actually qualified to operate a propulsion plant. Respondents said that, even though watchstanders had qualified under PQS, they had little confidence in their ability to perform their tasks safely and effectively. The managers also indicated that personnel certified as qualified by PQS were not always actually able to accomplish their assigned duties. PQS standards were reported to be violated by those responsible for certification because of command pressure to qualify specific numbers of personnel to satisfy readiness inspection requirements. Consequently, PQS does not always provide managers with a reliable means of discriminating among qualified and unqualified watchstanders.

Respondents reported that the operating procedures of the EOSS could not be used in their present form on the pilot ship for the following reasons: (1) They did not always apply to their ship's equipment and were often inaccurate and incomplete, (2) procedural steps were too slow for practical operations, and (3) users need additional information about specific procedures and control locations to follow the operating procedures.

Respondents indicated that the OJT support system is adversely affected in two ways by the high turnover of senior qualified personnel. This turnover increases the influx of unqualified replacements who need to be trained, while, at the same time, reducing the number of senior personnel who provide the training. Because the senior qualified operators are the most skilled and experienced personnel available aboard ship, they are called upon to stand watch and perform maintenance in addition to supervising and conducting training. Thus, the amount of productive time they can realistically commit to training is quite limited. Nevertheless, managers stressed that OJT, as currently employed, is still the preferred training strategy because the apprentice must be put to work as soon as possible after arrival aboard ship. The shortage of qualified personnel to serve as tutors is further compounded by the lack of accurate supporting technical documentation, which limits the opportunities for self-correction and improvement. As a result, inappropriate operating procedures and practices are often passed on from one operator to the next. Faulty operating practices generated in this way are extremely difficult to correct.

The need for accurate technical documentation to support performance was emphasized by respondents. They noted that, although a wide variety of technical materials is aboard ship, only the Plant Operating Guide (POG) was available in sufficient quantities for convenient access by trainees. Although the POG provides system diagrams and equipment operating characteristics in schematic form, it is not generally suitable for trainees, because the format is crowded and the schematics require interpretation beyond the abilities of an apprentice. Another potentially useful document, the Propulsion Plant Manual (PPM), was said to be out of date, and only a limited number of copies were available. Technical manuals, which were available only in limited numbers, were too complex to serve as aids for apprentice performances.

A more detailed summary of comments on watchstander performance, PQS, preventive maintenance, safety, and EOSS is provided in Appendix B.

Results of the survey of East Coast aircraft carrier and major commands confirmed that (1) the performance problems and support system deficiencies reported in the pilot ship were generally common in all 600/1200 psi main propulsion plant ships and (2) the ability to attain and maintain three qualified main propulsion watch sections was a significant fleetwide problem.

CONCLUSIONS

1. The needs assessment provided sufficient information about main propulsion performance deficiencies to initiate development of appropriate training solutions.

2. The needs assessment is feasible for use in other shipboard areas where mission performance capablities do not appear to meet specified performance standards.

FUTURE DIRECTION

The information derived from the needs assessment is being used to design and develop a shipboard main propulsion training program to alleviate the identified performance discrepancies and associated support system deficiencies.

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APPENDIX A

MANAGER AND OPERATOR QUESTIONNAIRES

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MANAGER QUESTIONNAIRE[1]

Respondent Code ____

I. Introduction

A. Brief on Effort
B. Code and Biographical Data
C. Brief on Format of Interview

II. Problem Areas

A. Watch Standing, i.e.:

BT	MM	Others
-- Top Watch	-- Top Watch	-- EM (Switchboard)
-- Console Oper.	-- Throttleman	-- Oil King
-- Auxiliary	-- Upper Level	-- Water King
-- Checkman		-- EOW
-- Burnerman	-- Pumpman	-- ____________
-- Messenger	-- Messenger	-- ____________

__ 1. Maintain 3 Section

__ 2. PQS Paper Qualification

__ 3. Performance of PQS Qualified Personnel

__ 4. Other: ______________________________

B. Maintenance

__ 1. PMS

__ a. Understanding PMS directions

__ b. Performing PMS (locating equipment, tools and materials, opening and securing equipments, etc.)

__ 2. Corrective Maintenance

__ a. General Space(s) and Condition (steam leaks, bilges, etc.)

__ b. Equipment Status

__ c. Safety Devices

__ d. System Troubleshooting

---

[1]Biographical data were also appended on back of interview form.

___ e. ____

___ f. ____

___ g. ____

C. Other

___ 1. Safety Procedures

___ 2. Feed Water Test/Treatment

___ 3. ____

OPERATOR QUESTIONNAIRE

Respondent Code______

NAME:______________________________

RANK/NEC/RATE:______________________________

JOB TITLE:______________________________ PQS QUAL. LEVEL:______________

TIME IN SERVICE:______________________________ TIME ON SHIP:______________

PREVIOUS EXPERIENCE: (Ship Type, Time, Duties)______________________________

____

1. Are you PQS qualified?______ If not, why?______________________________

2. If qualified, do you feel you know all you need to about your job?

____

3. What things are you asked to do on watch in addition to what you are supposed to do?

____

4. Do you think that other PQS qualified people really know their jobs?

____

5. Do you know how to fight fires in your area?

____

6. Do you get enough supervision?

____

7. How did you learn your job?

____

8. Could anything be done to make your job easier to learn?

____

9. Do you have any problem understanding EOSS directions?

____

10. Do you have any problems performing PMS or getting the right equipment, tools, supplies, etc.?

11. Do you have any problems doing corrective maintenance of valves, major equipment, or the space in general?

12. Do you have any problems with safety procedures?

13. How about feedwater test and treatment?

APPENDIX B

SUMMARIES OF OPERATOR AND SUPERVISORY OPERATOR PROBLEM STATEMENTS

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SUMMARIES OF OPERATOR AND SUPERVISORY OPERATOR PROBLEM STATEMENTS

Watchstander Performance

A majority of responding watchstanders (47/63) and watch supervisors (8/11) indicated dissatisfaction with their personal knowledge or capability concerning operation of the main propulsion plant. Responses were grouped into three categories: (1) system information, (2) problems with specific equipment, and (3) general lack of confidence.

Twenty-three of the watchstanders and all but one of the watch supervisors indicated some form of dissatisfaction with their personal knowledge of the main propulsion plant as a system. The specific concerns related to lack of understanding or comprehension of plant functioning from a system context. Selected comments follow.

1. Watchstander: "I am not really qualified. I would like to know more about what is really going on so that when a casualty is announced I will know what to expect."

2. Watchstander: "I need in-depth knowledge to know what I'm doing."

3. Watch supervisor: "I don't know my job. I know how to run the plant, I know how the plant works but it doesn't make sense."

4. Watch supervisor: "Often things happen and I don't know why. The deaerating feed tank always runs high, we check it out and can't find out why. It seems to have a mind of its own."

Eight watchstanders and two watch supervisors indicated equipment-specific concerns related to their own watch stations, but no consistent patterns related to specific plant subsystems were apparent. However, all console board operators indicated desires for more information on how the automatic combustion control system functions. Examples of the comments made by the watchstanders are:

1. "I have a problem with the automatic control console. They threw it at me too fast and I couldn't get access to the simulator for practice."

2. "I need to know more about the pumps I run. I know how to operate them, but I would like to know what goes on inside."

Fourteen watchstanders indicated a lack of confidence in their own ability to perform under various circumstances. The primary emphasis was on the ability to respond to equipment or system malfunctions that are referred to as casualties. Selected comments are:

1. "I was not confident on (the) checkman (watch station). I never felt I knew everything; there was always something popping up I couldn't handle."

2. "I'm not comfortable on watch yet. I had two (casualty response practice) drills and never had anything really happen. I need more experience and training."

3. "They showed me how to do everything, but I have had no practice since."

Personnel Qualification Standards (PQS)

A majority of watchstanders (50/80) and watch supervisors (10/13) responded in the negative when asked if watchstanders qualified according to existing PQS really know their jobs. The general trend of the comments was that PQS is not presently effective and that PQS qualification does not relate very well to actual ability to operate the propulsion plant. Concern was focused on the ability to deal with nonroutine situations such as light-off (plant startup) and casualties (malfunctions). Examples of the responses follow.

1. Watchstander: "They know what they are supposed to do, but not beyond the normal task. If something went wrong requiring a man to think his way out of a problem, most would be lost."

2. Watchstander: "They can be signed off (as qualified), but they really don't know the requirements or why they must do certain things. The Engineering Mobile Training Team asks men why they are doing certain functions and the answer is often somebody told me to."

3. Watchstander: "Being signed off as qualified doesn't mean you are qualified. Things can happen here that cause some people to panic and forget what to do."

4. Watch supervisor: "They may know the fundamentals but they don't understand the equipment operation and interrelationships."

5. Watch supervisor: "Some know their jobs, most don't. PQS stresses superficial tasks but nothing in depth. For example, no one down here really knows the proper way to start the 1200/600 psi steam pressure reducer."

6. Watch supervisor: "Anybody can get signed off on PQS, that doesn't mean he can do his job."

Preventive Maintenance System (PMS)

A majority of both watchstanders (56/62) and supervisors (11/14) indicted problems when asked if they had problems with the preventive maintenance system (PMS). The primary concern among watchstanders was obtaining necessary materials and tools to accomplish the required tasks. Although three also mentioned problems with the related directions on the maintenance requirements cards (MRCs). The supervisors also mentioned problems with materials and tools plus motivational factors related to administration of the system. Examples follow.

1. Watchstander: "We don't have the best tool setup. Tools are either scattered around or locked up and the person with the keys isn't around."

2. Watchstander: "I don't understand some MRC cards, but if someone explains what it means, I can do the PMS."

3. Watchstander: "We have problems getting lubricants and filters."

4. Watch supervisor: "The guys don't want to do PMS. They have no interest because it seems a waste."

5. Watch supervisor: "We can't get tools. Also, if PMS says it's time to wash down a piece of equipment and it has already been cleaned, we get put on report for 'gun decking' if we don't clean it again."

6. Watch supervisor: "There is a lack of people who can do maintenance, when PMS identifies a problem. Also, we don't have the right equipment and tools are a problem.

Usually, the inexperienced people end up making things worse and there is no one to teach them what to do."

Safety

Only a minority of the watchstanders (11/63) indicated safety problems. Half of the watch supervisors (7/14) indicated they felt there were problems. However, no truly consistent complaint emerged, although concerns were stated about burns and use of the tag-out procedure for isolating components from steam or electrical sources. Examples follow.

1. Watchstander: "We went cold-iron on the way to Hong Kong to allow the system to cool so we could repair some valves. Before the plant cooled we were told to go to work and a number got burned. Sometimes on duty days we work 24 hours at a stretch and become careless and wind up having to redo things."

2. Watch supervisor: "Everyone is somewhat lax. We all need a training emphasis on safety."

3. Watch supervisor: "We do not have the correct manual down here for looking up safety procedures."

4. Watch supervisor: "Tag-out needs better implementation."

Engineering Operational Sequencing System (EOSS)

Half of the responding watchstanders (10/20) and all of the watch supervisors (7/7) indicted problems with the existing operating procedures of the Engineering Operational Sequencing System (EOSS). The majority of the watchstander statements indicated that the procedures could not be used in their present form. Reasons given included: (1) the procedures do not apply to the ship's equipment, (2) the procedures are too slow, and (3) the user must have additional information about specific procedures and control locations to be able to follow the EOSS procedures. The principal category of supervisor complaint was that the procedures are often wrong and cannot be used effectvely. Examples follow.

1. Watchstander: "I don't ever go to the book; it's too complicated and hard to follow. It needs to be rewritten and made relevant to this ship."

2. Watchstander: "The book is sometimes confusing, the way it goes about explaining how things are done. It doesn't really say where or how to do things."

3. Watchstander: "EOSS has some awfully strange things in it as to how to do things. It doesn't seem to really pertain to this plant. If I performed light-off like it said in the book, I would blow fires out before I got the system going."

4. Watchstander: "Some instructions on a piece of equipment might actually pertain to another ship or main propulsion space and not work on the equipment I am operating."

5. Watch supervisor: "The coverage of EOSS is incomplete, inadequate, and wrong. It doesn't break down to where my people can understand it. When I run into problems I should submit a feedback (recommended change) but I normally just tell my people to work around it. I have submitted feedbacks in the past with no results, why bother?"

6. Watch supervisor: "I understand EOSS perfectly, but it is written wrong. You can't use it sometimes. It is a good idea but it needs help."

7. Watch supervisor: "MMs seldom use EOSS. I looked at one on feed pumps but it's not much use. It would take half a day to start a feed pump if I used it."

8. Watchstander: "To tell the truth I never use it. It is not much use because it would take half a day to light-off if I used it."

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